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ONE NEW YORI. PLAZA FIRE

New York, N. Y.

AUGUST 5, 1970

REPORT BY

THE NEW YORK BOARD OF FIRE UNDERWRITERS

BUREAU OF FIRE PREVENTION AND PUBLIC RELATIONS

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REPORT OF FIRE AT

ONE NEW YORK PLAZA

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INTRODUCTION

At 5:45 P.M. on Wednesday, August 5, 1970, the finishing touches were being made on the new quarters of Oppenheimer & *Co.*, located on the 31st, 32nd and 33rd floor of One New York Plaza. The rugs had been laid, furniture installed, pictures hung and all was ready for their move on the following Monday. Three of the firms' executive secretaries were on the 33rd floor admiring with pride the view of New York Harbor and the luxury and beauty of their own offices. They did not realize that at that moment a fire was starting that would leave their beautiful offices a mass of charred unrecognizable ruins. They did realize as they went through the offices on the 32nd floor that there was developing a strange biting odor but it was not strong enough to prevent them from continuing their tour of the 31st floor.

Shortly after the girls had left the 33rd floor, the guard hired by Oppenheiiner & Co. became aware of the fire on his floor when he saw smoke above the ceiling through an opening where the ceiling tiles had been removed. He reportedly pulled the fire alarm box on his floor and then took the elevator to the first floor to notify the building guards of the fire. Whether the fire department was notified by his operating the alarm is uncertain but it is known that the two guards and a telephone installer supervisor took the elevator to go to the 39th floor to notify employees of the fire. As their elevator rose it stopped at the 33rd floor, smoke and flames rushed in, forcing them to the floor. Whether because of blockage or warping of the doors, or failure of the controls, the elevator would not move from this floor. The two guards perished and the telephone foreman was barely alive when rescued by the firemen about two hours later. Other workers in another elevator were more fortunate when their elevator stopped at the fire floor. Although smoke and heat did rush in, the doors finally closed and the elevator carried them to safety.

Other supervisors were displaying the same care for their men under their charge and were going through sections of the building to make sure that none were trapped. One of these foremen went into the 33rd floor and entered the reception room area but was unable to get into the corridor nearest the south wall because of the dense acrid smoke coming from the area between tlie reception room and the east wall.

Meanwhile, employees and executives still at work on various floors of the building became aware oft he fire in a typical manner. An executive on the 43rd talking with a co-worker, noticed a smarting and tearing in his eyes and then saw smoke coming out of the window air-conditioning unit. Smoke was also visible outside the windows of the east side of the building. In all cases, the remainder of the occupants were notified and evacuated either by elevators or down the stairs because of the heavy smoke condition that developed on many floors of the building.

While this evacuation was taking place because of visual detection, smoke was being drawn into the air-conditioning system and at about 5:50 the smoke detection equipment at the fans shut down the supply fans and sounded an alarm in the engine room and on the Chase

Manhattan control board. One of the building engineers reportedly called the fire department by phone although records indicate that the first alarm was called in by a guard in an adjoining building. Since the building fire alarm boxes are not connected to a central station or to the fire department, it appears that the manual fire alarm from the 33rd floor produced no results.

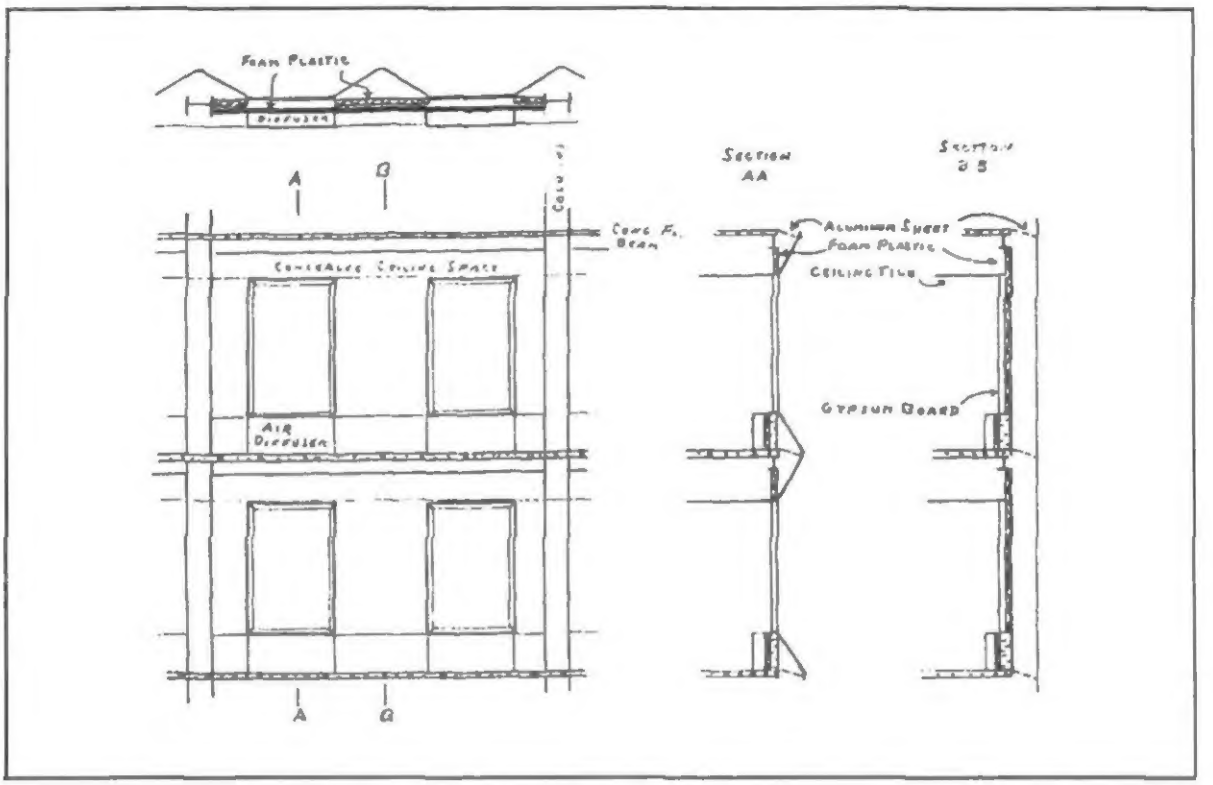
South section of 33rd floor showing complete destruction offurniture, partitions and acoustical ceiling.

The fire department responded within three minutes, but by this time, the 33rd and 34th floors were raging infernos with so much smoke and heat that the firemen could operate on the floor for only a short time. It was five hours before the fire was brought under control and in those five hours, two lives were lost, thirty men were injured and almost ten million dollars damage was caused.

Construction

To comprehend the progress and reasons for this fire, it is necessary to examine the structure and occupancy of this building in detail. As may be seen from the photo on the cover, One New York Plaza is a typical modern skyscraper completed early in 1970. The building consists of fifty stories above grade and three stories below grade. The first twenty stories are approximately 222 feet by 286 feet, and the next thirty stories, or the tower section, are approximately 143 feet by 286 feet. There is a reinforced concrete center core which contains the elevator shafts, stair towers, rest rooms, utilities, and air-conditioning supply and return air shafts. Steel girders connect this core to columns at the outside wall of the building so that the floors are column-free except at the east and west sections. Beams support the 2½ inch thick concrete floor on fluted floor form units, and are joined to the concrete floors by steel studs so that the concrete acts as an extension of the top chord of the beam. Columns, girders, beams and the underside of floors are protected by sprayed asbestos fibre to provide a 4-hour fire resistance for columns and a 3-hour rating for filler beams and floors.

Walls are made up of aluminum panel window sections which also encase the outside columns. There is a six inch concrete-block curtain wall 28 inches high built on the outer edge of the floor slab. This wall is located in line with the center of the wall columns so that the outer skin is 16 inches out from this wall. This separation creates vertical flues the height of the base or tower section which are interrupted at each floor level by an aluminum metal flashing designed to collect condensation and carry it through weep holes to the outside. The inside face of the curtain wall, the space between the windows, and the space above the windows is insulated with 1 inch Dorvori FR 100 Polystyrene Foam Board. This insulation is covered on the inside by gypsum board only where visible. There is no covering on it above the hung ceiling. As a result, the protection between the concealed ceiling spaces of two floors consists of 2 one inch thick pieces of foamed polystyrene and a thin sheet of aluminum.



Sketch of outer wall arrangement showing vertical flues, aluminum flashing, and foamed plastic insulation.

The hung ceilings in this building are Johns-Manville, Class 25 Acoustical Tile. The concealed space between the hung ceiling and the floor above contains air supply ducts. lighting fixtures, power lines in conduit, telephone cables and comniunication cables. The outer coverings on many of these are polyvinyl chloride or other synthetic materials. There are no firestops to subdivide this large concealed space.

The air-conditioning system is typical of that being installed in modern buildings. All of the supply fans are located on the 19th floor and all of the return fans are located on the 20th floor. Return air could be dumped to the outside by the operation of louvers. A proportioned amount of fresh air can be added before the return air passes through the medium efficiency filters on the 19th floor. There is a common plenum at the 19th floor for all air-conditioning fans. Fans #1 and #5 supply air to the peripheral air-conditioning systems for half of the building from the 4th to the 50th floor. This air is divided into a warm air arid a cold air supply which passes through shafts located at the four exterior carriers of the building. Air comes out of the shaft at each floor level through circular ducts and feeds either warm or cold air to the window diffusers on the floor of exit and the floor above. Connections from this main duct to the diffuser units ist hrough 6. 7 and 8 inch diameter flexible ducts made of fibre glass cloth on a steel wire spiral. Where these flexible ducts pass through the floor there is clearance around the ducts which is not fire-stopped, of up to one and one-half inches. Fans 2, 3 and 4 feed the interior air-conditioning systems through ducts which pass to the various floors through shafts in the center core. Hot arid cold air are blended in mixer units located in the concealed ceiling

space and the tempered air is then carried by flexible ducts to one side of the fluorescent light fixtures for distribution into the working areas. Return air passes through an opening on the other side of the lights into the plenum which is the entire concealed space between the hung ceiling and the floor above and then to one of five return shaft openings on each floor level. All openings into the shafts, whether for supply or return air, are protected by vane type shutters equipped with fusible links. There is a separate air supply fan for the kitchen on the 3rd floor and for the computer rooms on the 10th and 11th floors. All of the supply fansare protected by an Acme Fire Alarm, Model 170 DA Smoke Detector, made by Pyrotector Company.

Protection

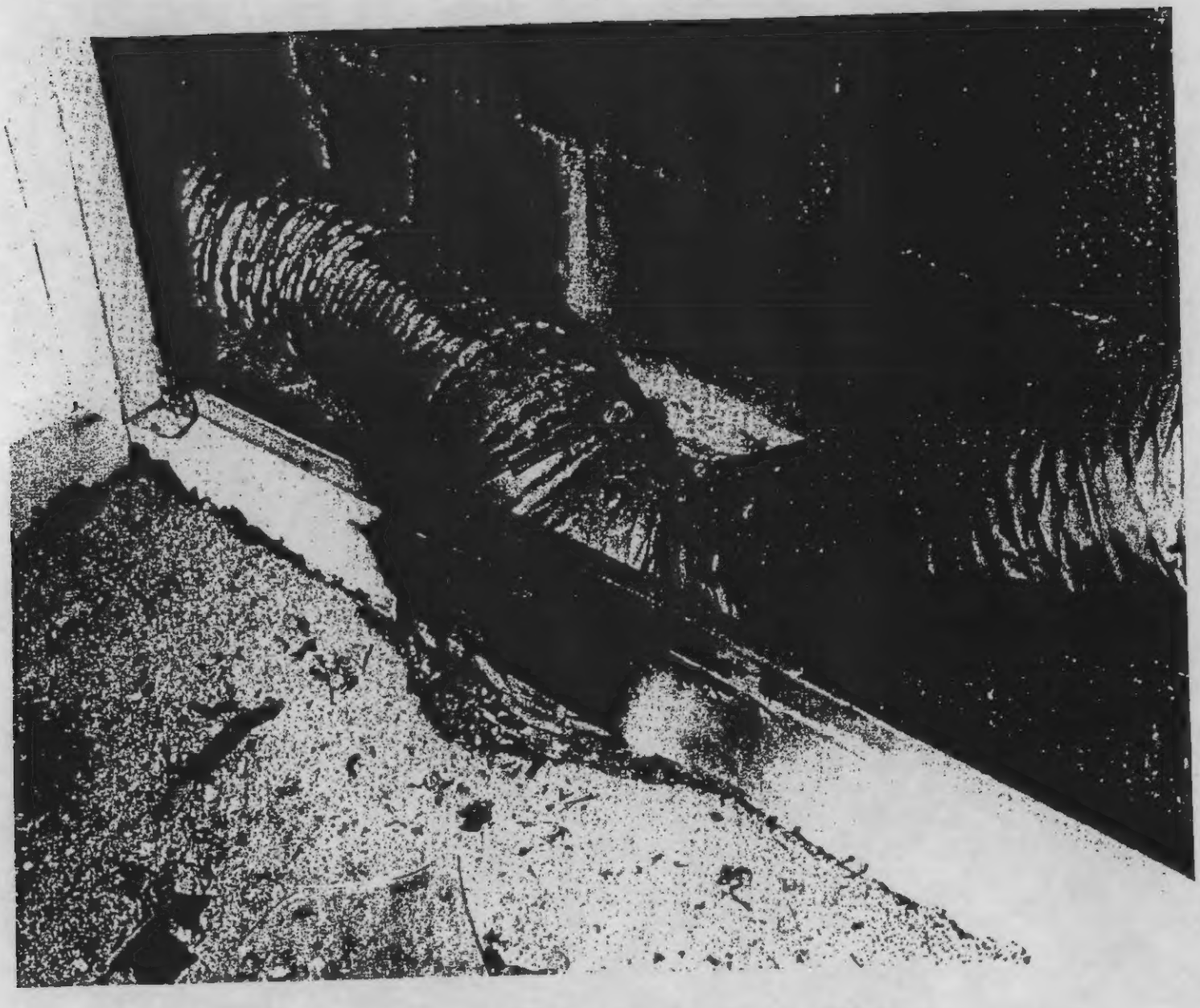
Fire protection for the building consists of six-inch standpipe risers in each of the stair towers supplied by 13,000 gallon tanks, 5,000 gallons reserved for standpipe use on the 19th, 33rd floors and roof. In addition there are two nranual, 750 gallons per minute fire pumps taking suction from city mains in the engine room. Fire department connections to the standpipe system are located at four sides of the building. Although not required by the Building Code. there is a manual fire alarm system consisting of one pull box on each floor which sounds an alarm every tenth floor in the service elevator lobby, at the first floor lobby control console and at various machine rooms throughout the building. Operation of the manual fire alarms, smoke detectors or sprinkler system automatically shuts off the supply fans for the air-conditioning system.

Occupancy

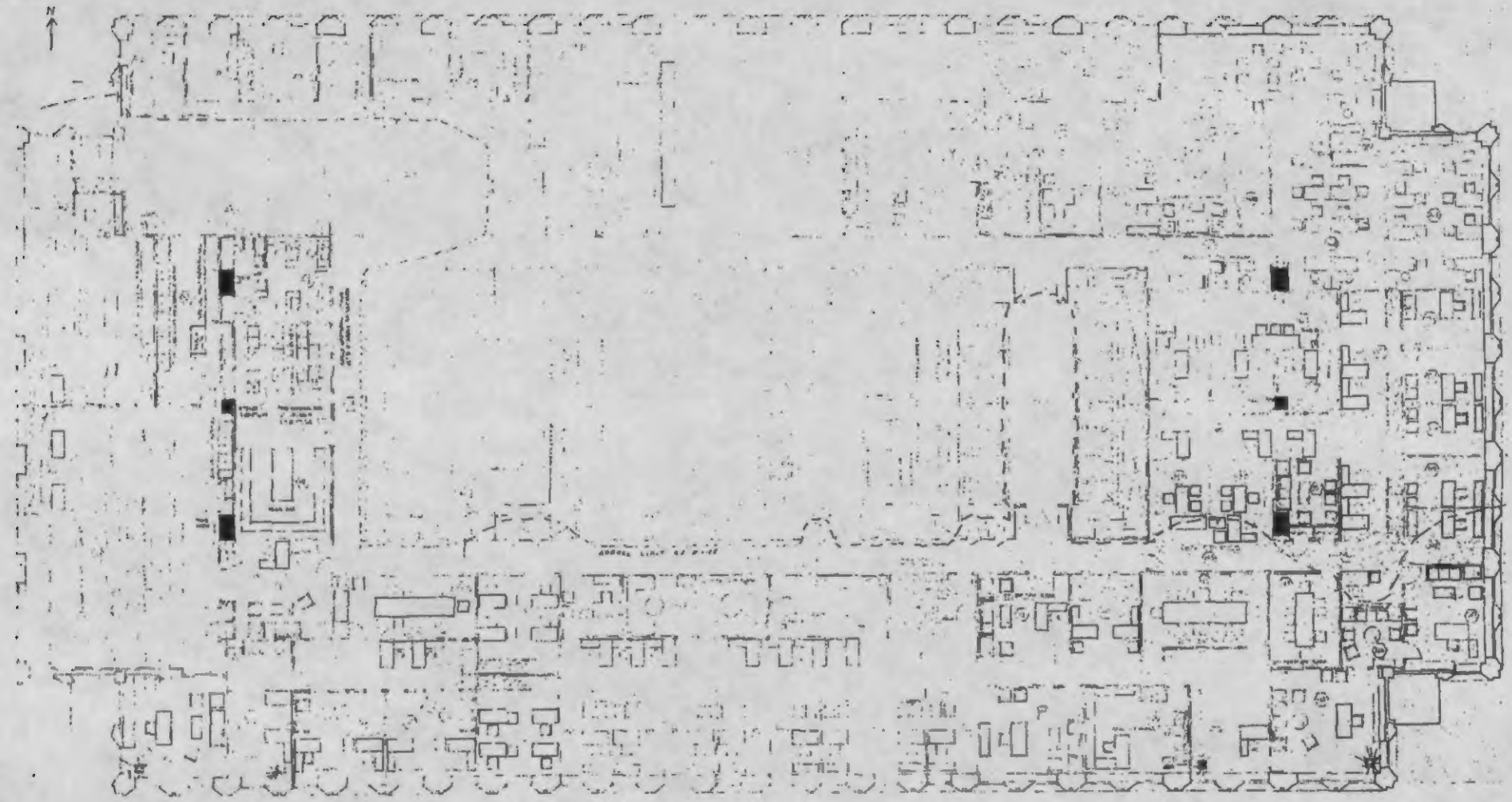
The building was only partially occupied by tenants at the time of the fire. The sub-basement areas are used for auto parking and machine rooms, the basement contained a banking office, shops, and a restaurant. The first floor was entirely entrance lobbies. Chase Manhattan Co. occupy the 2nd to the 18th. and 21st to 24th floors. The 19th and 20th floors are air-conditioning rooms. The 25th and 26th are occupied by several stock brokerage firms. The 28th, 29th and 30th are occupied by construction offices and storage of construction materials. The 31st, 32nd and 33rd were to be occupied by Oppenheimer & Co., the following Monday. The 34th floor was occupied by New York Securities Dealers' Association and Townsend-Greenspan Co. The 35th to the 39th floors were being prepared for occupancy by International Nickel Co. The 41st to the 44th are occupied by Salomon Brothers.

The layout of the 33rd and 34th floors are shown in Prints No. 4 and 5. The 33rd floor contained the executive offices of Oppenheimer & Co., and was designed as a showplace and was richly and tastefully furnished and decorated throughout. Most of the desks were wood, most of the chairs had foamed plastic or rubber cushions and backs. Sofas in various offices were scuffed with feathers or foamed polyurethane. All of the furniture was covered with clear plastic sheeting. Rugs were of wool with fibre pads. Storage files were of metal. An essential part of stockbrokers' operation is stock market data distribution throughout the various offices. This information isg athered and collated in computers in various parts of the country and fed to control units on each floor from which point it is available at viewing units in individual offices. There were 10 Ultronic Control Units in Room 313, which served about 20 desk units on this floor. Fifty-two conductor cables ran to each desk unit as well as a coaxial cable where there was also a TV viewer. These TV viewers received their power supply from standard outlets near the units. There was a similar arrangement in the Townsend-Greenspan Co. in the north sector of this floor.

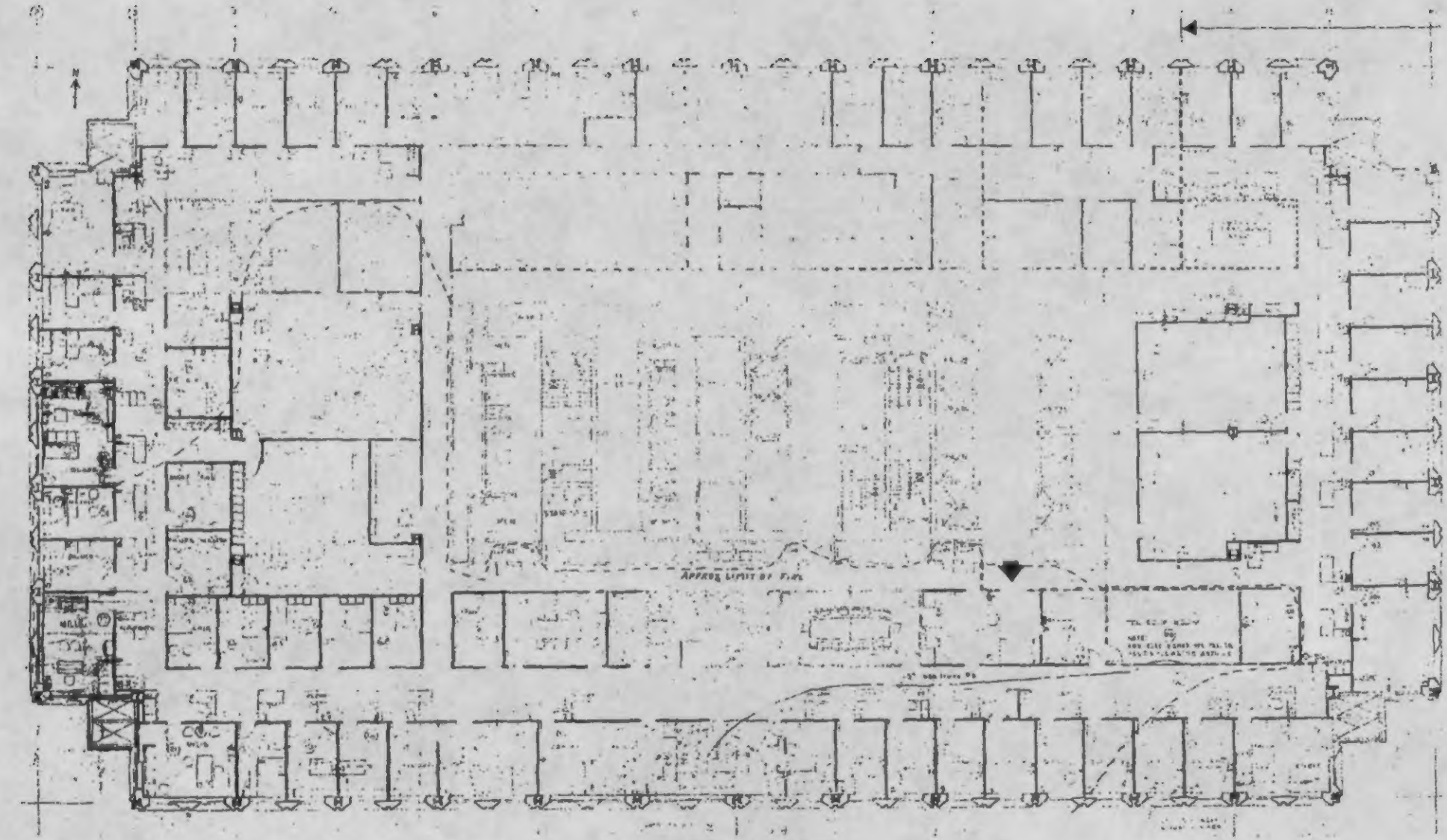
On the 34th floor there was a telephone control room containing telephone station equipment and 701 direct dialing units. as well as control units for stock data. This equipment served telephones throughout the floor and eight desk data display units located in the trading room and adjacent offices. Cables ran between these two locations in the concealed ceiling space on the 33rd floor. The remainder of the 34th floor was a typical well-furnished office occupancy, with wood desks and foamed plastic and metal chairs.



Fire transmission around duct on 35th floor. Foamed plastic was on visible face of spandrel wall.



4 -- Layout of 33rd floor.



5 – Layout of 34th floor.

Story of Fire

The progress of the fire has been traced as well as possible by examination of the ruins and direct information from witnesses. The fire was first detected in the concealed ceiling space of the 33rd floor in the vicinity of, or directly under the telephone equipment room on the 34th floor. Whether the fire originated in this space or in one of the offices in this area is still being investigated. This concealed space contained a substantial number of exposed cables having insulation of some degree of combustibility. The fire was drawn through the plenum in a westerly direction partially because of the conference room walls which hindered movement in an easterly or northerly direction. The fire probably spread to the exposed polystyrene foam in the south and east walls and emerged from the concealed space via flaming droplets or flaming gases. As the heat involved overstuffed furniture its progress accelerated because of the amount of combustibles and the flammable gas given off by the foamed polyurethane. Tests made after the fire showed that the polyurethane foam gave off flammable gases at 212°F. The fire was drawn towards the center core by the air-conditioning system and the damper on the south wall of the core operated. However, *the* damper on the west wall may not have closed since it was found partially open after the fire. The intensity of the fire about thirty minutes after discovery was such that all combustibles in the south section of the 33rd floor were involved and the fire was spreading to the west section of the building. Because of the air flow toward the center core the fire did not reach as high an intensity att he west wall. However. the rush of flame toward the west air shaft created a hot spot directly at this entrance to the shaft and ultimately caused a collapse of the 3 inch gypsum block wall at this point. The supply air fans were shut down early in the fire but the return air fans continued to run until about 7:30 P.M.

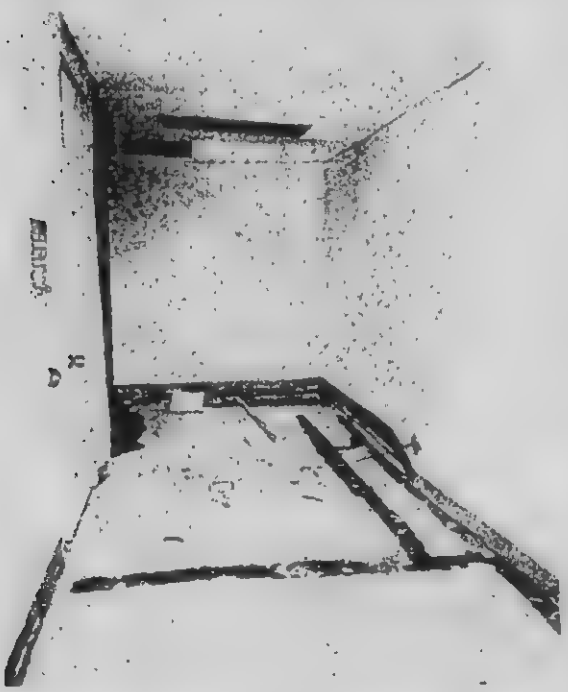
Fire was conveyed to the 34th floor through openings into electrical and telephone closets from the concealed spaces, around the air-conditioning flexible ducts where they passed through the floor, through the mail chute, through electrical connections in the floor and probably by the cables themselves. The openings around the air-conditioning ducts created a hazardous situation since the heat and flame passing through these openings melted and ignited the polystyrene insulation in the outer wall. Paper stock, wiring and insulation was set on fire in the south central and west sections of the 34th floor but the burnout was not as complete as on the 33rd floor because of fire fighting action. The fire spread to the 35th floor at the west end of the building through spaces around the air-conditioning ducts and the foam insulation in the outer walls was set afire and spread the fire into the ceiling concealed space. Since the return air fans did not shut down, smoke was drawn into the return air shafts through the openings on the 33rd floor, as well as through unsealed openings into the shaft. This smoke was carried by positive pressure through the supply ducts and to some extent through the return air shafts to the various florors. This smoke was of sufficient intensity on most floors to require evacuation.

The fire department responded promptly and took elevators to reach the vicinity of the fire floor. The first group were trapped in the elevator shaft at the 4th floor because nf failure of the elevator and had to chop their way out of the shaft to escape the heavy smoke. Other units were delayed by malfunction of the elevators until they used the bank that took them to the 30th floor. Hose lines were attached to the standpipes in the stair towers for fighting the fires but the smoke was so dense that masks were required and the heat was so great that the men could stay on the floor for only a short time. The firemen had difficulty in venting the fire because of their reluctance to break windows out for fear of casualties on the ground and because the windows, while of the tilt-type, were held closed by five latches that required a special wrench for operation. They finally stopped the fire at the northwest and southeast corners of the 33rd floor and at the north section of the west end and east section of the south side *on* the 34th floor.

Structural steel damage at west end of 34th floor. Note empty bolt holes and beam resting on flange of main beam.

Fire Damage

The area damaged by fire is shown on Prints 4 and 5. The outer skin of the building and the aluminum flashings were melted above the windows in the south wall of the 33rd floor and the south and west wall of the 34th floor. Destruction of the furniture and equipment on the 33rd floor was complete from southeast corner to the northwest corner. Temperature of about 1500" was reached which even melted the bases of typist chairs. Steel beams in the south center and west center sections of the 33rd floor were twisted or deflected several inches and the connecting bolts sheared off or failed allowing



Damage to partitions on the 35th floor from dropping of concrete floor.

the beams in some sections to rest on the flange of the girder. Telephone and electrical equipment in closets was completely destroyed by melting of plastic parts, burning of insulation and shorting.

Damage to furniture on the 34th floor extended from about the center of the south section to the area just west of the center core. Beams were severely deflected and distorted and the most severe structural damage occurred in the west section of this floor.

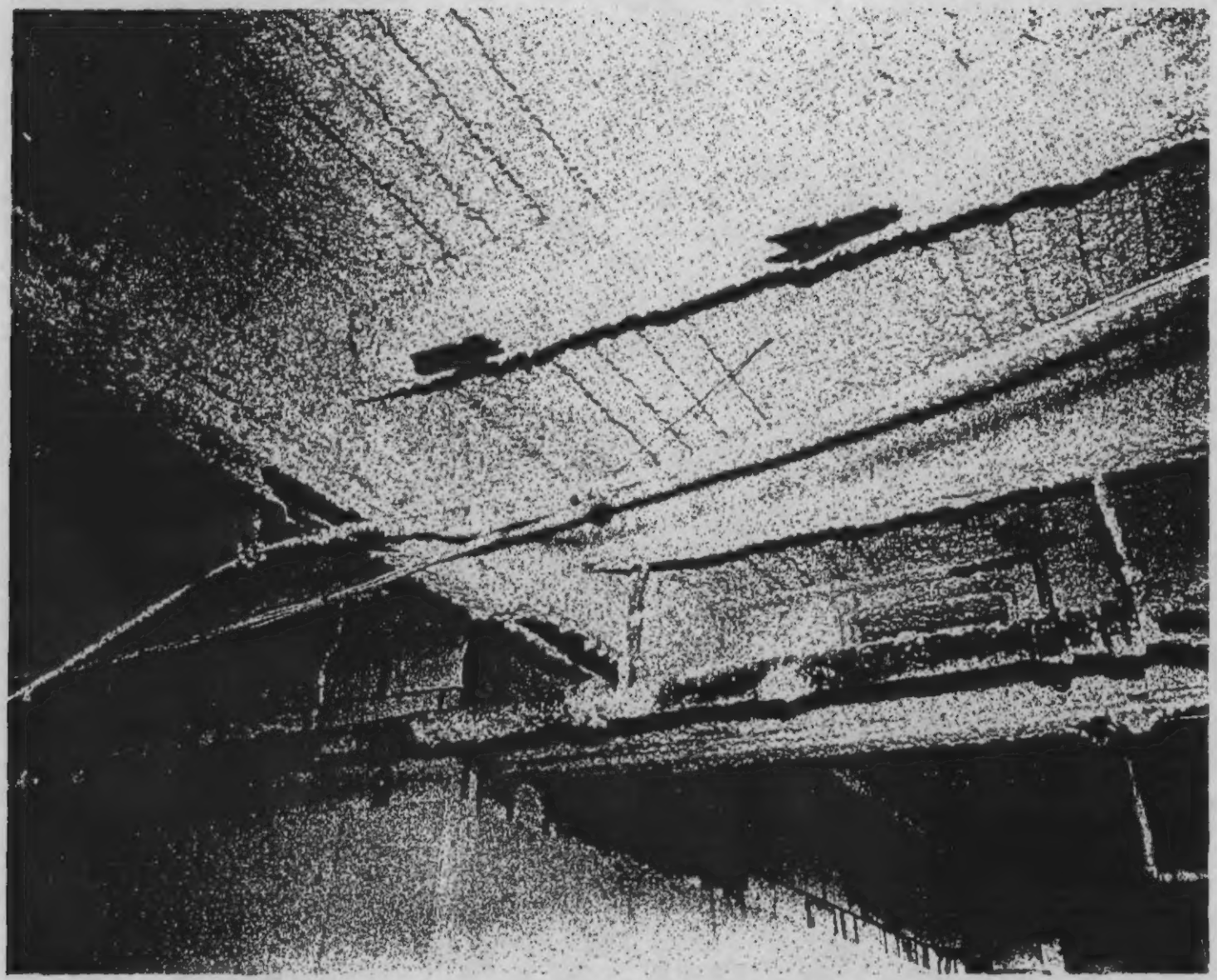
Water damage on lower floors was extremely light because of the New York Fire Patrol funneling water down the stair towers and elevator shafts, thereby preventing it from running through openings in the floors and ceilings.

The reason for the severe fire in this fire-resistive building can be understood if it is realized that the building classification is a *misnomer*. Buildings of this type erected in this Plastic Age should more correctly be called "Semi-Combustible". Except for the concrete and metal, almost everything in the building is combustible to some degree — foam plastic wall insulation, electrical cables, ceiling tiles, partitions arid insulation on air handling units. The degree in sonic cases is small but added to the severe fire hazard caused by foamed plastic furniture, there is the recipe for this conflagration.

The degree of damage to the steel frame is the result of several factors. It is reported that this steel came from England and became severely oxidized in transit. As a result, the sprayed asbestos fibre did not adhere well in many places and fell off along with the scale shortly after application. As a second factor, this insulation was removed in niany locations where partitions were run to the underside of beams. where air ducts run under beams, where clamps are attached, where wires scrape it. The situation that exists in a laboratory when this material is tested is not the same situation that exists in the field.

Openings in the floors around air-conditioning ducts, electrical fixtures and the cables themselves, as well as the vertical shafts in the outer wall cut off by only a sheet of aluminiim allowed fire to spread between floors.

The large area of the ceiling plenum, the flexible cables in this plenum and the large volume of air handled contributed to this loss as well as the difficulty of venting the products of combustion and especially the lack of planning for this contingency.



Sprayed protection on unfinished floor of building. Note return air shatter in center leading into west return air shaft.

Effect on Computers

This fire also demonstrated the effect of a fire on remote areas of the building. Perhaps of greatest interest is the behavior of computer equipment on other floors. Chase Manhattan *Co.* has 21 computers on the 11th floor and Salomon Bros. have 3 computers on the 43rd floor. These areas are well guarded by their own guard forces and at Chase by Pyralarm Smoke Detectors and CO_2 flooding and at Salomon Bros. by Kidde F T 100 Smoke Detectors. Because of difficulty with ar efrigeration compressor in the basement, the computers were running on reduced load from 5:30 to 6:30 P.M. on the day of the fire. When smoke was carried into the computer rooms by the air-conditioning system, the smoke detectors operated. Since the Chase official knew of the fire in the building when this occurred, he aborted the CO_2 system so that it would not flood the room and all units were shut down. Because of the density of the smoke all employees had to evacuate all the floors but returned as soon as possible and covered all machines with waterproofed tarpaulins kept in the computer room for just such an emergency. After the fire, tapes that were on the machines were cleaned, but no cleaning was needed for the computers themselves.

Salomon Bros. were not so fortunate. Smoke and soot deposits were very heavy on this floor and despite a separate air-conditioning unit that recirculates building air, the machines had to be vacuum-cleaned and a few exposed tapes gave some trouble. Tapes with a protective band were not affected.

Recommendations

This fire at One New York Plaza has provided a major full scale test for new methods of construction asw ell as for equipment and operations. The transmission of fire between floors, the distribution of smoke throughout the building, and the failure of structural elements prove the necessity of reviewing present requirements and practices.

Since this building is typical of a large number of buildings now being built, recommendations are being made on a general basis rather than applying specifically to One New Yotk Plaza. Any changes in this building will have to take into account the fact that the building is structurally completed and changes can be made only with difficulty.

1. The use of highly flammable foamed cushioning should be prohibited. Despite the apparent severity of this recommendation, it is apparent that the fire hazard of material that emits flammable vapors and has a high rate of heat release constitutes a serious threat to life or property.

2. The total fire load of "fire resistive" buildings must be reduced or automatic sprinklers installed throughout. The use of combustible furnishings, thermal insulation, electrical insulation, floor surfaces, partitions, ceiling tile has changed the fire hazard considerably from the days of the steel desks and chairs, linoleum or terrazzo floors, and a minimum of light and phone wires. Added to this increased fire load is the large size of the building without fire cut-offs, huge air-conditioning systems and difficult means of venting fire gases.

3. Wire (power and communication) in any part of an air-conditioning system should be encased in metal conduit or ducts. The use of insulation which can brenk down or burn when exposed to fire can intensify the transmission of smoke and fire because of the air drafts.

4. The protection of steel members in a really fire resistive building must be accomplished by materials that cannot be readily removed or damaged. It is apparent that sprayed fibre may not be universally applied to the proper thickness, that proper adhesion to steel may not take place and that the protection may be removed in many locations. such as at partitions, where ducts or wiring is run, and where clamps and brackets are attached.

5. Vertical flues in exterior walls between the skin and inner walls or partition should be cut off at each floor by a horizontal fire barrier with fire resistance equal to the floor.

6. Where openings through floors for air-conditioning ducts are permitted, the duct

should go directly to a non-combustible air handling unit containing no combustible material in the duct passage. Openings in the floor should be equipped with a compression type seal around the duct to provide a positive fire stop.

7. Wiring connections through floors should be provided with thermal insulation to prevent transmission of heat thereby negating the fire resistance of the floor.

8. Air-conditioning systems should preferably be restricted to serving only one floor. Since this is contrary to modern practices an alternate suggestion would be to subdivide the return air plenum by fire stops to restrict fire spread.

9. Automatic smoke detectors should be provided at each opening in the return air shaft unless the building is sprinklered.

10. Air supply for computer rooms should be from a location remote from the building air-conditioning intake and discharge, so that the computer rooms will not be subject tu smoke from fires in other sections of the building.

11. Means should be provided for venting the building during a fire. This may be accomplished by dumping all the return air to the outside if the air shaft has sufficient fire resistance to withstand the exposure and shutters are arranged to prevent the entrance of fire into floors from the shaft, All air movement on the fire floor should be stopped unless under fire department control.

12. Elevator call buttons should not be of a type that will call an elevator to a floor because of heat, smoke or flames.

13. Prefire plans should be drawn up for all buildings. This should include procedures for notifying occupants, calling the fire department, routes of exiting from the various floors and protection of valuable equipment.

14. Special equipment for fire department use for operating windows, shutters, fans and elevators should be provided and a planned procedure for emergency operation of the air-conditioning system should be formulated.

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